

## GEOLOGICAL AND MINERALOGICAL TOUR THROUGH MEDINACELI COUNTY (SORIA, SPAIN): FROM MEDINACELI TO VELILLA DE MEDINACELI AND SOMAÉN

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**Abstract.** We present a geological and mineralogical tour that will go through certain parts of the Land of Medinaceli in Soria province, in the southern sectors. In fact, we will look over the towns of Medina, Salinas de Medinaceli, Jubera, Longares, Velilla de Medinaceli and Somaén, all of them almost bordering with the province of Guadalajara. On this tour you will visit various mineralizations, some of which once operated (such as the iron ores of Jubera and Somaén). In this case, we will also observe the ferruginous mineralization filling karstic cavities, located in the municipality of Somaén, close to Velilla de Medinaceli. At this visit we can see mineralizations of goethite (limonite) and hematite. On the one hand, we will check out the crystallization of aragonite, laying among Triassic materials (Keuper), near Velilla de Medinaceli. These are known as pseudohexagonal twins, with concave angles, typical of this locality. On the other hand, we will visit the saltworks of Medinaceli, located among Triassic outcrops of Keuper, at the foot of this important historic city. These saltworks lay among outcrops of clay materials and gypsum from the Upper Triassic. Moreover, in this journey several observations will be made on materials of the Iberian Mesozoic, and they shall be made through the whole length of this route. In this manner, they will emerge from materials of Triassic, Jurassic and Cretaceous. Within this context, there is an angular unconformity between these materials and the overlying Cenozoic, near Somaén and Jubera.

### INTRODUCTION

On this occasion, there will be a geological and mineralogical tour, developing entirely in the county of Medinaceli, province of Soria (Castilla y León), in the southern part of the above mentioned Spanish province.

This trip will run in a unique way through a single geologic unit part of the Iberian Peninsula, named the Iberian Range, and more specific, the "Rama Castellana". Thus, we will basically find outcrops of Mesozoic material, partly covered by Eocene materials.

Referring to the situation of the rest of the region abovementioned, most of it is located within the "Rama Castellana" of the Iberian Range. However, the eastern tip of Tierra de Medinaceli is within the Almazán Depression, although we will not visit this area in this geologic tour.

## 2. MAIN OBJECTIVES.

The main objectives to be achieved with this geological and mineralogical journey, can be specified in terms of:

1. Study of the structure of the Iberian Range, between Medinaceli and Somaén - both within the region of Tierra de Medinaceli. Thus, we will only enter the so-called "Rama Castellana" of the Iberian Range in this tour.
2. Survey and observation of the Mesozoic materials that constitute the Iberian Range, and more specifically the Triassic, Jurassic and Cretaceous materials which form the basement of this Range - only in the locations this tour goes through.
3. At the same time, we will examine the Tertiary cover of the Iberian Range, which we will mainly find between the towns of Velilla de Medinaceli and Somaén.
4. Study and appreciation of different mineralizations along this route, with the following order:
  - 4A) mineralization in saltworks related to Triassic materials (Keuper), with an evaporitic origin. This mineralization can be observed from the town of Salinas de Medinaceli.
  - 4B) aragonite diagenetic mineralization in the vicinity of Velilla de Medinaceli, in all cases within the "Rama Castellana" of the Iberian Range.
  - 4C) concentrations of ferruginous ochers, linked to mineralizations of karstic cavity filling. We will also see these concentrations around Velilla de Medinaceli and Jubera.
5. Description of the exploitations of geological resources related to the abovementioned mineralization, especially those of halite and iron ocher.
6. Observation, if that is the case, of the restorations made to mitigate the impacts from mining activities. If not, we could also notice natural restoration.
7. Observation of elements related with Geological Heritage. In this section, some GPI (Geological Points of Interest) such as aragonite crystallizations in Velilla de Medinaceli, the mineralization of karstic cavity filling of Somaén or Jubera, or the Mesozoic —Cenozoic angular unconformity of Jubera— Somaén, among other places, are included.
8. Observation of the elements related to the Mining Heritage. In this section, some PIMH (Points of Interest Mining Heritage) as the saltworks of Salinas de Medinaceli or other holdings in Somaén, among other places, are included.

## 3. BACKGROUND

There is no record of the existence of geological and mineralogical routes that pass through the same places this tour does. However, there is a work (Mata-Perelló, 1995) which partly agrees with this, at least in the main paths of travel. As for the general geological features, there is no knowledge of the existence of work dedicated to these lands but the publication IGME (1972), to which we refer below. Regarding the mineralizations that we will see along the route, we refer to another work, particularly in Mata-Perelló (1990). All these publications, as well as others, are listed in alphabetical order in the chapter labeled "References".



1. General view of the salines.

#### 4. GENERAL TOUR ITINERARY

This short route will run entirely along the county of Medinaceli. Thus, it will start in the town of Medinaceli, where we will do the initial stop of this tour. Then, we will go through a short rural path to end up in the surroundings of the town of Salinas de Medinaceli, where we will make a stop at the saltworks the town is named under. Even though we will go to the saltworks, we will be able to observe them from the first stop. After that, the journey will return back to Medinaceli, and we will go to the nearby towns of Longares and Jubera from there, stopping near the latter locality. Once we stop in

the tour will move towards Velilla de Medinaceli in order to make two new stops, one just before arriving at this town, and the other at its boundary with the town of Somaén. Finally, the tour will head to Somaén, and its itinerary will conclude after making one last stop in the vicinity of this village.

#### ITINERARY

Stops are normally structured, this itinerary is made out of a series of stops. In each of these stops we will make a brief comment - geological or mineralogical. In each case we will indicate, between parentheses, the number of the topographic sheet (1:50,000 scale, National Cartographic Institute and the Army Geographical Institute). In this short tour, we will only use one sheet - to be more specific, sheet number 435 (or Arcos de Jalón). The list and description of the different stops are:

##### Stop 1. Roman Arch of Medinaceli (Medinaceli, County of Medinaceli, Province of Soria)

The route begins in an interesting historic place, next to the Roman arch of Medinaceli, located in the southern part of the town. From here, you can enjoy a good view of the valley at the foot of Medinaceli. It was excavated by the young Jalón River between the soft materials of Keuper, which are clearly distinguishable due to its reddish color. Indeed, Medinaceli is an interesting strategic position because of its location on a hill over the valley of the Jalón River.

##### Stop 2. Saltworks (Salinas de Medinaceli, County of Medinaceli, Province of Soria)

In the last stop, we will go down to the neighborhood next to the N-II, where we must go to the nearby town of Salinas de Medinaceli in order to reach the location of this stop. This stop is located next to the access road to the town, shortly before arriving to the town - about 4 km from the previous stop. In this case, we have been traveling between chalky and clay levels of Keuper (Upper Triassic), which form a large outcrop located at the foot of Medina, as we would have seen in the previous stop.

We will often see halite between levels of gypsum (Fig. 1). Due to groundwater movement between these materials, halite dissolves easily, resulting in the formation of salt water. Thus, we can observe salt efflo-



Figure 2. Mineralization of the Ocher mines of Las Lomas.

On this tour, we will exclusively drive by Mesozoic materials of the "Rama Castellana" of the Iberian Range. These materials belong to Triassic (Keuper) – more precisely to Supra-Keuper.

We can observe ferruginous concentrations (Fig.2), very terreous, located at the contact line between calcareous levels of Supra-Keuper, and others belonging to Eocene. In this manner, among the present iron ore (all oxidized), it has to be mentioned the hematite (always very dirty) and goethite (very terreous and with limonite). On the other hand, there are also indications of lepidocrocite (such as goethite: terreous and limonite) as well as siderotil. Finally, notice that this is a ferruginous mineralization associated with filling of karstic cavities in Mesozoic limestones.

#### 5.4 Stop 4. Velilla de Medinaceli road (Velilla de Medinaceli, County of Medinaceli, Province of Soria)

In this stop, we will go first to the N-II road heading east, back to the start of the road to Velilla de Medinaceli. After taking this road, the stop is at about 2 km from there – 5 km from the previous stop.

Throughout this journey, despite the carbonate outcrops mentioned in the previous stop, the materials belong exclusively to Keuper. In this stop there is an interesting outcrop with abundant big aragonite crystals, but not very well crystallized. Often they show pineapple-like forms.

In this location, aragonite crystallizes in pseudo-hexagonal twins but generally concave. This gives them an appearance of stars, giving them some instability, so they are eroded much more easily than common.

#### 5.5 Stop 5. Ocher iron mine of Somaén (Somaén and Velilla de Medinaceli, County of Medinaceli, Province of Soria)

From the previous stop, continue to Velilla de Medinaceli, but at a short distance from the outcrop there is a road on the left. This road leads to the nearby iron mines of Somaén (Fig. 3). To get there, drive for about 2 kms from the previous stop.

These mines are located on a mineralization related to filling karstic cavities, located at the contact line between levels of Supra-Keuper with others belonging to Eocene.

rescences in springs, related to water evaporation. These salt waters are collected in a series of bases, in which water evaporates leaving a salt residue.

#### 5.3 Stop 3. Ocher mine of Las Lomas, (Jubera, County of Medinaceli, Province of Soria)

After the previous stop, it is necessary to go back to Medinaceli, and then continue through the N-II, heading east (to Zaragoza), following the old road along the Jalón River. This road passes by Lodares first and by Jubera second.

From this last town, we will take the upward path that leads to the old ocher mine of Las Lomas, below the motorway -10 km from the previous stop.



Figure 3. General view of the Somaén mine.

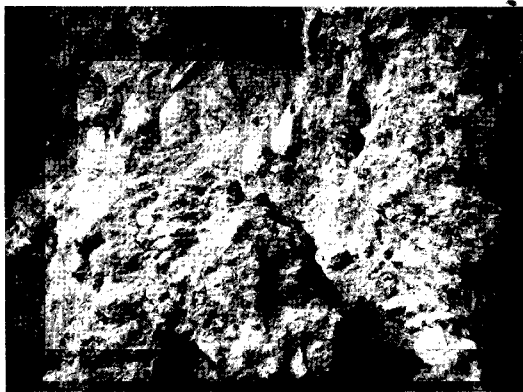


Figure 4. View of the mineralizations of the Somaén mine.



Figure 5. View of the galleries open through the iron oxides.



Figure 6. View of the karstic mineralizations.

Among the existing iron minerals, we must make special mention of goethite (limonite), with an intense and beautiful yellow color. Hematite is also present - very abundant and terreous.

In the existing galleries of this mine, especially in the one located to the right (Fig. 4), the mineralization can be perfectly observed filling karstic cavities (Fig. 5, 6). Thus, within this gallery there are fallen blocks, clay varves and others. These materials are usually covered with Mesozoic material.

Furthermore, from this place (looking to the NW), an interesting angular unconformity can be observed (Fig. 7). It is located between Mesozoic and Cenozoic materials. The former, of Jurassic age, are folded, while the latter, of Eocene age, are in subhorizontal position.

## 5.6 Stop 6. Somaén (Somaén, County of Medinaceli, Province of Soria)

From the previous stop, you have to make a brief tour to get to the town of Somaén, where we will make our last stop, just before entering the village - 5 km from Stop 5.

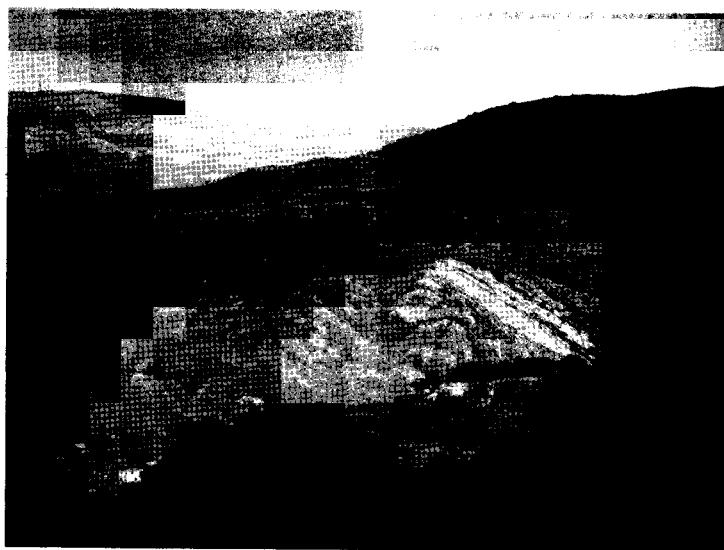


Figure 7. Angular unconformity between Mesozoic–Cenozoic in Jubera – Somaén.

On this tour, we will initially go through Keuper materials (mentioned in the previous stop) and then limestone belonging to Upper Keuper, eroded by the Jalón River, forming a beautiful gorge. Above these materials, we find Eocene detrital levels, which can be seen now at the area around the town of Somaén.

## REFERENCES

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